

REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 9-13 and 17 are pending in the present application.

In the outstanding Office Action, Claims 9-12 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Goesele et al. (US 6,150,239, hereinafter “Goesele”) in view of Usenko (US 6,995,075). Claim 13 was rejected under 35 U.S.C. § 103(a) in view of Goesele and in view of Usenko and further in view of Maleville et al. (US 6,403,450, hereinafter “Maleville”).

Applicants respectfully traverse the rejection of Claim 17. Page 4 of the Office Action states “there exists no evidence of record that the implantation defect concentration in first 500 nm provides unexpected result in the thin film produced.” Applicants respectfully disagree.

The unexpected results from the claimed “implant defect concentration in the first 500 nm of implanted SiC is lower than 9.10^{20} atoms/cm³” can be understood from the present specification.

By way of explanation, the “state of the prior art” section of the present specification describes a convention method for transferring thin layers of silicon carbide. However, in conventional methods the SiC transferred onto a silicon oxide completely lost their electrical conductive properties and had become completely isolating. It has been shown that the electrical compensation introduced into the transferred films and responsible for the acquired isolating property is linked to the implantation defects created in the SiC by the passage of the protons used to carry out the implantation.¹

¹ Specification, page 2, lines 2-24.

The high dosage of protons required to obtain the transfer of a thin film of SiC creates, over the whole path of the ions between the implantation surface and the average ion implantation depth, a concentration of implantation defects that behave, from an electrical point of view, as acceptor centers.²

Thus, the implantation defect concentration is critical in that it affects the electrical properties of the SiC thin film (i.e., less than 500 nm in thickness).³ It is the present inventors that have determined that the profile of electrical compensator defects is proportional to the profile of the implantation defects.⁴ The invention defined by Claim 17 generates, through a choice of implantation conditions, a thin film that contains, after implantation, at least one zone with a profile of defects sufficiently spread out in a homogeneous manner in the film that has to remain. The portion of the film with a defect concentration that is insufficient is eliminated by thinning down.

The Office relies upon Goesele to describe a film with a thickness of 580 nm and a hydrogen concentration at the maximum (at 580 nm) of approximately $6 \times 10^{21} \text{ cm}^{-3}$. However, this description from Goesele pertains to a silicon substrate (see col. 10, line 23 of Goesele) and not to a substrate of SiC (for which the implantation conditions are very different). Thus, this portion of Goesele is not relevant to the invention defined by Claim 17 (“implanted SiC”).

Applicants note that MPEP § 2144.05(ii)(B) states:

A particular parameter **must first be recognized as a result-effective variable**, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

² See, Specification, page 3, lines 9-14.

³ See, Specification, page 7, lines 24-27.

⁴ See, Specification, page 7, line 28 to page 8, line 10.

Goesele does not recognize that implantation defect concentration in SiC affects the electrical properties of the SiC. In the invention defined by Claim 17, the quantity of implantation defects in the first 500 nm of the implanted thin layer of SiC is considered, and this parameter is not at all considered by Goesele.

Thus, Goesele does not recognize the features of Claim 17 as result effective variables, and the features recited in Claim 17 are not matters of “discovering the optimum or workable ranges” of a parameter as asserted in the outstanding Office Action on pages 3-4.

Furthermore, pages 2-3 of the Office Action acknowledge that Goesele does not disclose the claimed “thinning down the thin film transferred on the target substrate,...the thin layer of SiC thinned to a thickness lower than 500 nm.” The outstanding Office Action relies upon Usenko to describe thinning.

Usenko describes thinning layer 111 with an optional step.⁵ This thinning step is not realized on a layer transferred by the implantation/separating steps of Claim 17.

Usenko describes a method wherein the silicon thin layer is obtained by epitaxial growth on a porous surface. The epitaxial part that is near the porous layer is of bad quality because it contains pores, and it must be eliminated.⁶ This part (i.e., the part with the pores) is eliminated from the thin layer through thinning.

Thus, from Usenko, a person of ordinary skill in the art only knows to remove the epitaxial part with pores from the thin layer. However, this feature from Usenko is not applicable to Goesele since there is no epitaxial part with pores to remove. A person of ordinary skill in the art, if presented with the description from Usenko, would not know what portion of any substrate in Goesele to remove by thinning since Goesele does not include any epitaxial parts with pores.

⁵ See, Usenko, col. 1, lines 58-61, “the finalizing step might also include.”

⁶ See, Usenko, col. 2, lines 30-49.

Page 3 of the outstanding Office Action states “[i]t would have been obvious to one of ordinary skill in the art at the time of invention to thin the layer because **Usenko** teaches that thinning beneficially removes the worst quality part of the layer” (emphasis in original). Applicants respectfully submit that this mischaracterizes Usenko. Usenko uses thinning for a specific purpose (as noted above), and does not describe the use of thinning for a broader purpose of removing the worst quality part of the layer. Usenko does not disclose that thinning should be applied to any layer. Usenko only describes thinning being applied to an epitaxial part with pores, which is inapplicable to Goesele. Furthermore, the Office fails to explain why any part of the layer in Goesele would be recognized by a person of ordinary skill in the art as being of such a bad quality that the person of ordinary skill in the art would seek to remove it.

The Office Action has not identified an apparent reason to add thinning to the process of Goesele.⁷ In this regard, the BPAI has stated:

The *KSR* Court noted that obviousness cannot be proven merely by showing that the elements of a claimed device were known in the prior art; it must be shown that those of ordinary skill in the art would have had some “apparent reason to combine the known elements in the fashion claimed.” *Ex parte Whalen*, p. 16 (quoting *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, (2007) (citations omitted).

In other words, an attempt to bring in the isolated teaching of Usenko’s thinning into the method of Goesele amounts to improperly picking and choosing features from different references without regard to the teachings of the references as a whole.⁸

Moreover, the Office Action, Usenko, and Goesele fail to provide any guidance as to how much of the layer in Goesele needs to be removed. It is noted that Usenko and Goesele

⁷ See *Ex Parte Smith*, at page 14 (citing *KSR*, 127 S.Ct. at 1740-41, 82 USPQ2d at 1396.).

⁸ See *In re Ehrreich* 590 F2d 902, 200 USPQ 504 (CCPA, 1979) (stating that patentability must be addressed “in terms of what would have been obvious to one of ordinary skill in the art at the time the invention was made in view of the sum of all the relevant teachings in the art, not in view of first one and then another of the isolated teachings in the art,” and that one “must consider the entirety of the disclosure made by the references, and avoid combining them indiscriminately.”)

fail to identify any portion of a layer in Goesele as being of bad quality and in need of removal.

In view of the above-noted deficiencies, Applicants respectfully submit that a person of ordinary skill in the art could not properly combine Goesele and Usenko to arrive at the claimed:

thinning down the thin film transferred on the target substrate,

wherein the ion implantation step is performed with selected dose, energy and implantation current such that the implantation defect concentration in the first 500 nm of implanted SiC is lower than $9 \cdot 10^{20}$ atoms/cm³, whereby a number of acceptor defects compatible with the desired electrical properties of the thin layer is obtained in the thin layer of SiC thinned to a thickness lower than 500 nm.

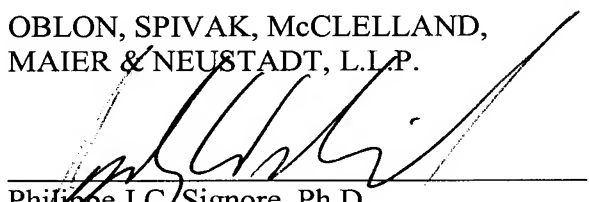
Thus, Applicants respectfully submit that Claim 17 (and any claims dependent thereon) patentably distinguish over Goesele and Usenko, taken alone or in proper combination.

Addressing each of the further rejections, each of the further rejections is also traversed by the present response as no teachings in any of the further cited references to Maleville can overcome the above-noted deficiencies of Goesele and Usenko. Accordingly, it is respectfully requested that those rejections be withdrawn for similar reasons as discussed above.

Consequently, in light of the above discussion, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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